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New technology for SiC components for mechanical seals and sealless pumps

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SSiC-Materials for Highly Stressed Components in Sealing and Bearing Applications

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Summary

Silicon carbide materials are widely used for mechanical sealing and sliding bearing applications as well as in chemical process equipment. This can be attributed to their unique properties including high corrosion resistance in chemical aggressive environment, high hardness, strength, low density, good thermal shock resistance and thermal conductivity. Mechanical seals act as sealing components for rotating shafts requiring negligible leakage and long life under continuous exposure to sliding wear. High pressure mechanical sealings depend on the formation of a lubricating film in the seal gap in order to guarantee reliable operation. The breakdown of this film leads to mixed friction followed by dry running which can cause fatal failure within minutes. Sliding bearings are bearing component for rotating shafts. For optimum performance, sliding bearings must be operated at a certain rotating speed to reach the Elasto-Hydrodynamic Lubrication regime. In case of lower rotating speed, mixed lubrication or dry-running is observed which could lead to a failure of the tribosystem.

There are a number of methods to optimize mixed friction performance and dry running tolerance in silicon carbide sealings. In this report we explore microstructure modifications including coarser grained materials, pore incorporation and secondary particles as well as using tribologically active coating systems and laser structuring of the contact areas.